Security and Privacy for 6G: A Survey on Prospective Technologies and Challenges

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Abstract

Sixth-generation (6G) mobile networks will have to cope with diverse threats on a space-air-ground integrated network environment, novel technologies, and an accessible user information explosion. However, for now, security and privacy issues for 6G remain largely in concept. This survey provides a systematic overview of security and privacy issues based on prospective technologies for 6G in the physical, connection, and service layers, as well as through lessons learned from the failures of existing security architectures and state-of-the-art defenses. Two key lessons learned are as follows. First, other than inheriting vulnerabilities from the previous generations, 6G has new threat vectors from new radio technologies, such as the exposed location of radio stripes in ultra-massive MIMO systems at Terahertz bands and attacks against pervasive intelligence. Second, physical layer protection, deep network slicing, quantum-safe communications, artificial intelligence (AI) security, platform-agnostic security, real-time adaptive security, and novel data protection mechanisms such as distributed ledgers and differential privacy are the top promising techniques to mitigate the attack magnitude and personal data breaches substantially.